APPLICATION FOR LETTERS PATENT OF THE UNITED STATES

SPECIFICATION

To all whom it may concern:

Be It Known, That we, **Morag M. Eaton, David Horn, Ian A. Cranston, Stephen Ambler, Veerasamy S. Shanker, Steen Jorgensen,** and **David J.A. Riach**, citizens of Great Britain; Great Britain; Great Britain; Great Britain; Malaysia; Denmark; and Great Britain, residing at Fife, Scotland; Kircaldy, Scotland; Edinburgh, Scotland; Edinburgh, Scotland; Edinburgh, Scotland; Oslo, Norway; and Edinburgh, Scotland; respectively, have invented certain new and useful improvements in a **MULTI-TRANSACTION SERVICE SYSTEM**, of which we declare the following to be a full, clear and exact description:

MULTI-TRANSACTION SERVICE SYSTEM

KK 10-21-99 Insert: This application is a continuation-in-part of 09/886,485, filed 7-1-97.

Background of the Invention

This invention relates to a system for the supply of multi-transaction services, such as a financial services systems, a retail services system, or a communications system. The common factor is that each system is transaction-intensive and channel-specific, i.e. provides a substantial number of simultaneous service transactions through service-specific hardware and software channels.

In a multi-transaction financial services systems, a wide range of financial services is available through a variety of different delivery channels. Examples include a telephone call to a financial institution such as a Bank to inquire about a customer balance; a withdrawal of cash from an Automated Teller Machine(ATM), and use of electronic point of sale (POS) equipment. Each service is provided by service-specific hardware and software, i.e. a service-specific delivery channel, and each channel requires a specific connection to each possible host.

It is a disadvantage of such service-specific delivery channels that the services are difficult to expand or enhance, and difficult to maintain and control. It is a further disadvantage that potentially valuable information about customer activities and behavior is not easy to correlate across the channels, and much of the information can be regarded as "lost".

While the desirability of an integrated system having a number of different channels and capturing all customer information has been recognized for several years, no method of implementing such integration has previously been disclosed.

Summary of the Invention

It is the object of the invention to provide a multi-transaction service system which does not suffer from the disadvantages of known arrangements of a separate delivery channel for each service.

According to the invention there is provided a multi-transaction services system characterized by comprising a plurality of service request and supply channels each comprising channel-specific hardware and software;

at least one operation means comprising operation-specific hardware and software;

and connected between said channels and said operation means an integrated channel manager arranged to provide a first interface layer arranged to interface the channel-specific components of each channel; a second interface layer to interface said operation means; and between the first and second interface layers a third layer comprising at least one application service connectable to any channel in a channel-independent manner.

Preferably the system is a multi-transaction financial services system in which the channels comprises a plurality of financial service channels; the operation means comprise a plurality of financial service operation means, and the application services comprise business application services such as a balance inquiry, an account credit, an account debit, a cash deposit, a cash withdrawal, a cheque deposit a cheque withdrawal, a loan inquiry, a mortgage inquiry, an insurance inquiry, and the like.

Brief Description of the Drawings

The prior art will be described with reference to Figure 1, and the invention will be described by way of example only with reference to:

Fig. 2, which illustrates an integrated financial services system according to the invention;

Fig. 3, which illustrates the integrated channel manager schematically;

Fig. 4, which illustrates the architecture of a part of the system of Fig.2; and

Fig. 5, which illustrates an implementation of the system of Fig. 2.

Detailed Description

In the prior art it is known to provide a plurality of financial services through different hardware and software channels all connected to a data host. Fig. 1 shows six typical channels, 10, 20, 30, 40, 50 and 60. In channel 10, a customer 12 visits the premises of a Bank 14, and interacts with a human cashier (not shown) for example to withdraw or deposit cash. The financial transaction details are transmitted from the bank 14 through a wide area network (WAN) 16 having a data link 19 to a transaction data host 70, i.e. a central computer. Channel 20 is similar, the customer 22 visits a bank 24 and a transaction is recorded in the data host 70 through the WAN 16 and data link 19.

In Channel 30 a customer 32 visits a self-service financial terminal such as an ATM 34. The ATM is connected by a server 36 to a local database 38 arranged to authorize and control a transaction such as a request to withdraw cash. The transaction details are sent to the data host 70 by a data link 39. In channel 40 a customer 42 uses a digital telephone (or touch-tone telephone) 44 and the public switched telephone network (PSTN) 45 to initiate a transaction, such as a balance inquiry or transfer of funds between accounts; the transaction can be based on a voice prompt system, with the customer 42 keying in the appropriate response by number on the telephone 44. The PSTN 45 connects through a server 46 to a local database 48 arranged to authorize and control the transaction, and the details are sent to the data

host 70 by a data link 49. Channel 50 is similar, but the customer 52 uses a home computer 54 to connect to a server 56, which is connected to the local database 48, and by a datalink 59 to the data host 70.

In channel 60, a customer 62 is involved in a point-of-sale (POS) transaction at a POS terminal 64 which is connected to a server 66 and local database 68. The server 66 is connected to the host 70 by a data link 69.

Clearly, the service channels 10 to 60 are independent, are different in nature, and each involve separate and distinct hardware running software specific to that hardware and that channel. Historically, each type of channel was developed at a different date, often as an "add-on" service. As each new channel was developed, it was essential to arrange it so that existing channels were not overloaded or otherwise affected, and therefore separate local databases 38, 48, 68 were provided.

It is also clear that correlation of inputs across all of the channels is not easy, so that it is difficult to make customer information from one channel available through another channel.

For example the local databases 38, 48, 68, supply the data host 70 only with relevant information. The database 68 associated with the POS channel 60 may record the information "Mr. Smith ordered a washing machine costing £1,000", but it will send to the data host 70 "Debit Mr. Smith's account by £1,000". The detailed customer information has been lost, and there is no means within the system for recognizing that Mr. Smith may require insurance for the washing machine and therefore the opportunity of offering him this financial service has been lost.

In the integrated financial services system according to the invention, shown in Fig.2, a customer 80 interacts by channels 82, 83, 84, 85, 86, 87 with a number of services. Some of the services shown are identical to those in Fig.1, e.g. channel 82 allows a digital telephone 92 to be used for a balance inquiry or an account-to-account

transfer of funds; channel 83 provides a service through an ATM 93; channel 84 indicates a visit by the customer to bank premises 94; and channel 86 shows the use of a home banking system running on a PC 96.

Three channels are additional to those shown in Fig.1; channel 85 shows an automated sales terminal 95, which can be arranged to sell tickets for travel or entertainment or insurance or the like on a self service basis; channel 87 provides an interactive service by means of a television receiver 97; an additional facility is the opportunity for branch sales 99, such as the offer to the customer 80 of a financial service or product such as insurance from the local bank branch.

The hardware and software associated with channels 82, 83, 84 and 85, of the branch sales facility 99 are connected directly to an integrated channel manager ICM 100. The hardware and software of the channels 86 and 87 are connected through an information highway 102, such as a wide area network or the World Wide Web to the ICM 100.

A number of business service operation means are shown in Fig.2, i.e. a transaction processing host computer 112, on which all financial transactions running in the system are recorded; an item processor such as a cheque processor 113; a relationship management database 114 on which customer details such as income, expenditure, recent purchases etc. are recorded and classified; and a financial call center 115 from which telephone calls can be made to any customer of the financial institution running the system to offer a new service or a financial service suggested by e.g. a recent purchase. Each operation means 112, 113, 114, 115 is connected to the ICM 100. There is also provision for connection to an external data source 111, such as a record of stocks and shares and price movements of those stocks and shares.

The arrangement of the ICM 100 is shown in highly schematic form in Fig.3. The ICM can be regarded as having three layers; a first outer layer 120 has a number

of service channel interfaces 122, 124, 126 etc., one for each customer service channel, such as connection to the ATM 93 or the home computer 96. A second outer layer 130 has a number of business operation interfaces 132, 134, 136 etc., one for each business operation means, such as connection to the transaction processing host computer 112 or the cheque processor 113.

Each of the outer layers 120, 130 is organized so that each interface within it manages the channel-specific aspects of the hardware and software running the customer service channel or business service operation to which that interface is connected.

Between the outer layers is a third layer 140 which supports and executes a number of business application functions 142, 144, 146, 148, such as a balance inquiry, an account credit, an account debit, a cash deposit, a cash withdrawal, a cheque deposit, a cheque withdrawal, a loan inquiry, a mortgage inquiry, or an insurance inquiry, e.g. for a house, a car, a boat etc. An alternative name for a business application function is a business object. The common factor of all the business application functions or business objects is that the functions are channel-independent. Further any service can access any business application function which can provide information accessed in any business service operation.

This arrangement of the ICM 100 allows the access to every business application function to be channel-independent, both from the customer delivery channel point of view and the business operation means point of view, while the channel-specific parts of interaction with each customer delivery channel or business operations means are managed by the outer layers 120, 130 of the ICM 100.

For example, suppose business application function 144 is a balance inquiry. This can be initiated from ATM 93 or a computer 96 through the interfaces 124 or 126

respectively, and the data needed to answer the inquiry resides on the host computer 112 connected through the interface 134.

The ICM 100 routes a balance inquiry from either the ATM 93 or the home computer 96 to the balance inquiry function 144 as shown by the arrows A, B and connects the function 144 to the host computer 112 as shown by arrow C. The balance information is returned through the reverse route.

The ICM 100 is arranged so that the function 144 is unaware of the customer service channel originating the call, i.e. is unaware of its channel-specific hardware and software systems, but the customer service channel receives the information in the appropriate format. Similarly, the data host 112 is unaware of the business application function to which it is providing data, but that data is supplied to the business function in the appropriate format, and is not dependent on the hardware or software systems of the data host. In other words, the complexity of accessing multiple hosts from different service delivery channels is hidden by the ICM.

The arrangement illustrated in Fig.3 is schematic only. The required separation of channel-specific and channel-independent features of the system is achieved by reason of the novel architecture of the ICM 100 which is shown in Fig.4.

The architecture comprises seven layers L1-L7 as shown, and the arrangement is a variation of the NCR Open Co-operative Computing Architecture described in the "Knowledge Center" at

http://www.tkc.nrc.com

Under "Products and Systems" select "Architecture (OCCA)"

The layer L1 provides interfaces for the customer 80 through any customer service channel 82-87 and is the Human Interface Service layer. Each interface is channel-specific, as described above, but in layer L1 each channel has end points at which the services of that channel are mapped, thereby defining certain channel

specific features. Layer L1 does not provide access to the application services of layer L2. Layer L1 however provides access to the operation, administration and maintenance of the service requests.

Layer L2, the Application Execution Layer, monitors the execution of the business application services in layer L3, including start-up and monitoring of each application. For example, referring again to Fig.3, if the balance inquiry function 144 failed, then layer L2 would attempt to re-start it.

Layers L4 and L5 provide respectively application enabling services and distributed system services; layers L2, L4 and L5 may comprise in NCR's "Top End" middleware, described on the World Wide Web at address http://www.ncr.com/product/topend.

Layer L6 provides network services such as connections to geographically separated parts of the system, and layer L7 is the base platform, is the hardware and operating software layer, which may for example be Intel processors running the NCR Unix operating system.

Layer L3, Business Application Services, interacts with the Top End middleware of layers L2, L4 and L5, the architecture overall operating as described with respect to Fig.3 to provide channel specific interface layers 120, 130 to a number of business application functions.

The financial services provided by the system of Fig.2 can now be regarded as service oriented, rather than channel oriented as in the prior art. For example, if the customer 80 requires a cash withdrawal, the ICM 100 regards this as "a cash withdrawal service", which may be initiated by an ATM 93 or at a bank branch 94 etc.; in the prior art arrangement there would have been "an ATM service" or "a bank branch service".

The provision of the integrated channel manager 100 in effect draws together all the disparate sources of customer contact and information in a financial services environment. Information about a customer 80 is connected through all of the channels 82-87, and is made available by the ICM 100 to all of the business service operation means 111-115. The business services therefore have access to the customers contact history (e.g. the customer's entire use of ATMs, home banking systems, visits to a bank branch etc. which were previously logged only on a channel-specific basis); customer contact management (e.g. use of the collected customer history to offer services); and customer complaint handling (has the customer made a complaint? How was it handled? In what circumstances is it likely to recur?). The information can be used to provide targeted marketing through any channel the customer uses to access a service, i.e. the customer can be provided with details of financial products and services most likely to be attractive to the customer, given the customers' financial background and habits.

For example if a customer makes a major purchase, an offer of an appropriate insurance may be made by the financial call center 115. If the customer owns stocks and shares, information from the external database 111 can be used to initiate an offer of further shares as an advantageous share price is noted.

Similarly, the customer 80 has access to all of the business services by any channel, subject to restrictions placed by the financial institution, or on physical restrictions (e.g. it is still not possible to withdraw cash over the telephone, although loading of an electronic purse is a possibility).

It is a further advantage of this system according to the invention that new services can be added quickly and easily. For example, if the financial institution decides to add a car insurance scheme to its portfolio of financial products, then a central car insurance service may be added which may define the data to be collected

and its validation and storage. This component is channel independent. The service can then be pulled into each suitable delivery channel 82-87 as appropriate. Initially a user interface may be added to the call center 115 where data is entered by a call center agent, with the ICM 100 handling the interface between the call center and car insurance service. Later, a similar upgrade may be applied to self-service terminals 93,95 with no impact on the use of the service by the call center or the car insurance service itself.

Such additions of new services can be supported without shutting down the existing system, and services can be moved physically within the system environment without change to or impact on the existing channels.

The separation of business functionality from delivery channels can be applied in systems other than financial service systems. The invention can also be applied in the retail system, in which the customer service channels will include a Point Of Sale till, an automatic vending machine, and a loyalty card processing terminal, and the operation means will include a relationship manager to provide a base for customer services such as special offers, posting of coupons to selected addresses etc. Also, in a communications system, the customer service channels will include conventional telephone, cable television and interactive television facilities.

An example of an implementation is depicted using the three ring logical diagram shown in Fig. 5. This diagram comprises an outer ring 501 labeled "TOP END", a middle ring 502 comprising two sectors 503 and 504, of which the larger sector 503 is labeled "MOMS" and the smaller sector 504 is labeled "Other API", and an inner region 505 comprising three overlapping circles 506, 507 and 508. Circle 506 is labeled "Presentation", circle 507 is labeled "Function" and circle 508 is labeled "data management".

The inner region 505 is a logical representation of application elements that are physically distributed across an enterprise. Every application consists of three elements which are represented by the three overlapping circles Presentation 506, Function 507 , and Data Management 508.

Presentation element 506 is the application logic that controls the presentation of information to a user by methods such as display, printing, or voice. Presentation is also the application logic that controls the input of information by a user through devices such as a keyboard, mouse, scanner, OCR or card reader. The presentation element 506 is represented in Fig. 2 as the service channel devices 92, 93, 94, 95, 96, 97 and 99.

Function element 507 is the application logic that contains the business rules or business logic. The function element 507 is represented in Fig. 3 as business application functions 142, 144, 146 and 148.

Data management element 508 is the collection of data and the associated logic (including database management system) that manages data access and integrity. Data element 508 is represented in Fig. 3 as the business service operations 111, 112, 113, 114 and 115. Ideally, applications should be written with these elements separated to give better performance and all benefits of code re-use. However, in banks today there still exists an overlap of these 3 elements and this is illustrated by the overlapping circles.

The Outer Ring 501 labeled "TOP END" (TM), a proprietary system of the applicant, is represented in Fig. 4 as layers L2 - L7 and has already been referred to with reference to Fig. 4. It consists of the following software components that allow robust enterprise-wide network communication:

Directory Services - X.500, DNS, LDAP, OSF DCE, etc.

Messaging Services - X.400, POP/SMTP, MIME, etc.

Middleware Services - OSI DTP, OSF DCE, COM/DCOM, MOMA, CGI, etc.

Protocol Services - SNA, X.25, TCP/IP, etc.

Security Services - DES, RSA, Kerberos, ACL, GSS-API, etc.

Management Services - SNMP, DMI, OSF DCE, etc.

TOP END provides integrateable middleware, security and management services.

Middle ring 502 represents a Common Software Architecture designed to introduce re-use and commonality in software development across the delivery channels. A Common Software Architecture is a layered structure built upon three elements of the financial institution: business activities, business objects (i.e. data) required to perform those activities, and a technical foundation supporting those business needs. This layered structure closely resembles an object- oriented application architecture, yet it does not exclude the use of other approaches to designing software.

The middle ring is thus the architectural interface that glues together both the three elements of the Common Software Architecture described immediately above and the three application elements (Presentation, Function, and Data Management). It is also the interface that isolates these application elements from the network delivery and communication services. This is described in Fig. 3 as the service channel interface layer 120 and business operations interface layer 130. MOMS (Mini Object Management System) is a single interface that shields the service channel devices 92, 93, etc. and the business service operation 111, 112, etc. from the specifics of the interface to ICM 100. It is also the interface that has contact and knowledge of all channel related activities.

MOMS is the framework that permits software reuse across delivery channels while providing the flexibility to support the unique requirements of each channel. It is a rapid, cost effective, development infrastructure where reuse can be achieved and

new functionality introduced (e.g. new delivery channels, or new decision support capabilities) with minimal software development. The result is an improved infrastructure for application development and maintenance.

MOMS provides an organized environment for running a collection of objects in an enterprise wide distributed client/server system. It implements tools that allows the construction of objects that are willing to play by the framework's rules of engagement. MOMS also provides a way for these objects to exchange semantic-level metadata or self-describing data. The metadata allows loosely coupled objects to dynamically discover each other s services and behaviors at run time with a minimum number of rules, constructs, and metaphors so that objects can use them consistently. This facilitates a gradual, independent evolution of dynamically assembled webs of interacting objects, a significant value in a complex and rapidly changing system environments.

MOMS is a true implementation of an Object Framework written in C/C++. All application services and transactions are made available in the form of objects. Data and business logic are encapsulated within objects, allowing them to be located anywhere within a distributed system. These objects are totally independent of the underlying technology. It allows to inter-operate across networks, run on different platforms, coexist with legacy applications with object wrappers, roam on networks, and manage themselves and the resources they control.

MOMS objects are currently made available to Windows applications via DLL, OCX or ActiveX interfaces. There are also versions of MOMS available in the UNIX and IBM mainframe environment. MOMS includes an Object Store, an implementation of an Object Oriented database, which is available to all delivery channel applications. All objects queried from the Object Store by any application within the enterprise are returned re-instated. All services or transactions from any

delivery channel, that at one point or another come into contact with the MOMS framework leave a trail of information that is transparently stored for future use. However instead of MOMS, other Application Program Interfaces (API) can be used, as indicated by sector 504 in Middle ring 502 which is labeled "other API".

Information and services in banks today are either inaccessible or unusable to the various departments within a bank that could make effective use of it. This is a result of delivery channels that are implemented as distinct, separate stovepipes of infrastructure, information and application.

The architecture framework described here allows the easy access of information and services across the enterprise regardless of the disparity of existing delivery channels or new ones. This information and service is suddenly now available at the point of customer contact to enable more effective sales and servicing of customers. The end goal of this architecture is to enable a single consolidated view of customers, products, services and delivery channels within the financial institution.